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501 Santa Monica Blvd, Suite 312 +1.310.899.3026
Santa Monica, CA 90401 USA www.oceana.org

October 14, 2005

Dr. John Kirlin, Executive Director
Mr. Michael DeLapa, Central Coast Project Manager
Marine Life Protection Act Initiative
c/o California Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Dr. Kirlin and Mr. DeLapa:

Oceana respectfully submits this preliminary California Central Coast Marine Life Protection Act Proposal to meet the October 15, 2005 deadline set by the California Department of Fish and Game. As additional data and information become available over the next few weeks and months, we will modify this proposal to ensure it incorporates the most current information as well as input from the discussion and meetings that are integral to the Central Coast Marine Life Protection Act (MLPA) process.

The MLPA stakeholders, scientists, committee members, and staff bring impressive and powerful intellect, experience, and perseverance to this intricate and important process to evaluate and strengthen California's precedent setting network of Marine Protected Areas.

Oceana's preliminary proposal is the result of over three years of data collection, scientific research, and conservation efforts that we have conducted throughout the California Current Large Marine Ecosystem. In its development we have involved many people with varied backgrounds including scientists, policymakers, GIS expertise, legal counsel, and user groups.

The marine scientists who crafted this preliminary proposal have incorporated the available data to the best of our ability. As additional information, like the regional fisheries' data, becomes available, we intend to revise, refine, and improve our proposal and discuss this information with stakeholders to develop appropriate management measures to meet the objectives contained in the proposal.

The responsibility and challenge of this generation is to provide actions for immediate solutions and tools for the next generation that will reduce or mitigate the destruction of the Ocean ecosystems while maintaining the economy and harvest. Ultimately, ingenuity and prudence must prevail in order to change our ocean management paradigm to develop methods that sustain the food supply and economy without destroying the ecosystem. Our sustainable existence on this planet depends on this.

We look forward to participating in the Central Coast MLPA process to be part of the solution that will continue to provide opportunities for this generation and the next to enjoy the oceans for recreational, commercial, subsistence, and personal use like diving. Though we know it will not be easy, we feel it would be irresponsible not to offer our demonstrated experience, talents, and tools to help preserve, protect, and restore our Pacific Ocean ecosystems. We look forward to working with you to further participate in this process. Please do not hesitate to contact us at (907) 586-4050 if you have questions.

Sincerely,

Jim Ayers
Director, Pacific Region

Attachments: Proposal, Appendix 1 Maps, Appendix 2 Matrix and Maps

The Oceana California Central Coast Marine Life Protection Act Preliminary Proposal

Submitted to the California Department of Fish and Game
Marine Life Protection Act Initiative

October 15, 2005

Summary of Proposal

This is a preliminary proposal submitted to meet the October 15, 2005 deadline set by the California Department of Fish and Game (DFG). There will be additional information, discussions, and meetings over the next few weeks and months that shall be incorporated into this proposal. We are submitting this proposal to contribute to the MLPA process and would like to participate in the process throughout its duration. This proposal is the result of over three years of data collection, scientific research, and conservation efforts that we have conducted throughout the California Current Large Marine Ecosystem.

Clearly, management measures are subject to discussion about the information provided in this proposal and the information and data that is not yet available about the region's fisheries. As this and other information becomes available, we intend to revise our proposal and discuss this information with stakeholders to develop appropriate management measures to meet the objectives contained in this proposal.

However, as it currently stands, we are confident that the information provided in this proposal is sufficiently specific to be fully analyzed by DFG. We have invested substantial resources into providing our own analysis and evaluation, and hope that this proposal contributes to the work of the stakeholders and the MLPA Initiative. We look forward to further participating in this process.

Ecosystem Overview

One of the ten major Large Marine Ecosystems of the United States, the California Current Large Marine Ecosystem (LME) is one of the most productive and biodiverse ocean ecosystems on the planet. It contains large abundance kelp, zooplankton, and krill forming a solid foundation for a food web that supports sea mammals including humpback whales and elephant seals; millions of seabirds; endangered sea turtles; slow growing fragile deep sea corals; and fish species such as salmon, halibut, and crab that are important for commercial, recreation, and subsistence harvest.

The California Current LME is off the coasts of Washington, Oregon, and California from shore to the 200 mile Exclusive Economic Zone; and is integral to the economy, culture, and well-being of California as well as the American way of life. These waters provide opportunities for

millions of Americans, and Californians specifically, for recreational activities, commercial fishing, critical commerce supply links, subsistence and personal use, and a variety of economic activities including tourism.

The U.S. Commission on Ocean Policy and the Pew Oceans Commission reports include central recommendations for explicit accounting for the biodiversity, health, and productivity of ecosystems as a focus of marine and coastal management. Both reports stressed that our oceans are in peril and we must take immediate steps to change the way we manage them in order to reach a sustainable existence. We cannot control everything that affects the health of our oceans, but we can control the major anthropogenic influences that are causing our oceans to be in peril. The activities, actions, and management in state and federal jurisdictions are inextricably linked to the overall health of the California Current Large Marine Ecosystem.

The state waters of the California Current LME that fall in the jurisdiction of the State of California (shore to three miles) are the marine life and ecosystems being addressed by the Marine Life Protection Act.

The Marine Life Protection Act

The MLPA provides the opportunity to establish a model and procedures to implement in-the-water protections for the nearshore area. This must be coupled with management and protection actions for habitat and marine life in federal waters in order to lead us to the goal of a healthy, biodiverse California Current Large Marine Ecosystem.

The California State Legislature passed the Marine Life Protection Act in 1999, in part in recognition of the fact that the existing patchwork of marine protected areas in state waters did not live up to its potential. The legislature specifically recognized that marine reserves are an essential element to a marine protected area system, and thus established a process to review and modify the existing set of marine protected areas to include a marine life reserve component as well as coherent protection rationales and management measures. The marine life reserves in each bioregion shall encompass a representative variety of marine habitat types and communities, across a range of depths and environmental conditions.

The current review process of the MLPA applies to 855 square nautical miles of the California Current Large Marine Ecosystem, including all state waters between Pigeon Point and Point Conception. This is the area addressed by this proposal.

Oceana's overall goals for participation in the Central Coast MLPA Initiative are to maintain, protect, and restore the health of California's marine ecosystems on the Central Coast while building a model for ecosystem-based management on a larger scale.

Bottom Trawling in the Central Coast Study Area

Bottom trawling is by far the most destructive human activity threatening marine habitat in the Central Coast MLPA study area. The National Academy of Sciences (2002) Report on *The Effects of Bottom Trawling and Dredging on Seafloor Habitat* reflects the worldwide scientific

consensus that bottom trawling reduces the productivity, biodiversity, and complexity of benthic habitats. This is corroborated by a study on the California Central Coast by Engel and Kvitek (1998) which found that intensive trawling significantly decreases epifaunal invertebrate densities, physical habitat heterogeneity and biodiversity. These findings illustrate that allowing bottom trawling in the Central Coast is directly contrary to the goals of the MLPA and common sense.

Recent actions including the passage of Senate Bill 1459 by the California State Legislature and the Pacific Fishery Management Council (PFMC) decision on Essential Fish Habitat (EFH) resulted in extensive bottom trawl closures throughout California. In the MLPA study region, state waters are closed out to 3 nm from shore. In addition, the Monterey Canyon closure by the PFMC closed some sections of Monterey and Soquel Canyons to bottom trawling. However, a large area within the MLPA Central Coast study region in state waters remains open to bottom trawling. Available coarse and fine-scale data in the current MLPA process shows that while some of these open areas is likely to be soft substrate, there are significant rocky reefs, hard bottom habitats, and submarine canyon habitats in these remaining open areas. Furthermore, fine-scale substrate data is only available for a small portion of these open areas, and has revealed hard substrates in many other areas that do not appear in the coarse dataset. In other words, the areas open to bottom trawling in the MLPA study area are known to contain habitats that are easily damaged by bottom trawl gear and likely contain many more.

Monterey Bay is an internationally significant marine ecosystem. Its functioning depends on the quality of its habitats from the deep canyons to the shoreline. Given the importance of this area and the recognition of sciences and the State of California that bottom trawling should not be allowed in state waters, we propose that bottom trawling be prohibited throughout the Central Coast study area. To address the localized socioeconomic impacts that this prohibition may cause on bottom trawl fishermen, we recommend that the bottom trawl capacity reduction take place through buyouts and gear transfers.

Approach Used to Develop Proposal

To meet the goals of the MLPA, we began developing this proposal by identifying key scientific criteria to serve as indicators of areas of high ecological importance. We explicitly took a systematic step-by-step scientific approach to identifying areas based on the unique features of the Central Coast. Our overall approach in developing this preliminary proposal consisted of the following steps:

1. Identify key ecological criteria based on goals and objectives of MLPA
2. Gather and analyze datasets to identify features meeting key criteria
3. Identify important ecological areas in the Central Coast study area based on overlapping features in datasets
4. Analyze and subdivide each area in detail based on ecological features
5. Identify potential anthropogenic impacts to identified features to the extent information is available
6. Assign specific management objectives to each sub-area to protect identified ecological features

7. Evaluate the entire network based on each objective

Criteria, Information, and Datasets Used

Based on the goals of the MLPA, the Master Plan Framework, the Central Coast Regional Profile, and the Goals, Objectives, and Design Considerations Package from the CCRSG, we identified 10 key criteria (listed below) as a starting point for identifying Important Ecological Areas on the Central Coast. Many of these criteria are listed directly in Section 3.3 of the Regional Profile as "areas of biodiversity significance." Though there are other ecological criteria important to consider and include in an expanded MPA network, we found that these features were incorporated in the areas selected based on our initial criteria. (For example, while eelgrass was not explicitly used as a criteria, our proposal includes 100% of the mapped eelgrass in the study area.)

Next, we conducted a comprehensive search of existing information available from the MLPA Initiative and elsewhere. The information used to develop our proposal relies most heavily on the datasets provided by DFG from the IMS database, as well as some datasets developed by NOAA for the Pacific Region Essential Fish Habitat (EFH) process.

1. Hard substrate / rocky reefs. (Coarse Scale Habitat and Fine Scale Habitat layers from the IMS site, Zimmerman 2003 database of untrawlable areas)

2. Biogenic habitat (coral and sponge records compiled by the NMFS 2005 Preliminary Report of Occurrences of Habitat-Forming Invertebrates).

3. Canyons and canyonheads (Canyons of Central California data layer from IMS site)

4. Habitat for overfished groundfish (EFH EIS highest 20% Habitat Suitability Indices for NMFS declared overfished groundfish)

5. Nearshore FMP species and abalone habitat (habitat requirements listed in Nearshore FMP and Abalone Recovery Plan)

6. Marine mammal rookeries/haulouts (known elephant seal colonies and marine mammal rookeries and haulout layers from IMS site)

7. Seabird colonies and foraging areas (major seabird colonies data layer from IMS site and upwelling centers as a proxy for foraging areas)

8. Estuaries / coastal marsh (Estuaries and coastal marsh data layers from IMS site)

9. Kelp forests (Kelp records from IMS site including persistent kelp and available individual years 1989, 1999, 2002, and 2003)

10. Top fish and bird diversity areas (Highest 20% fish and bird density and diversity data layer from IMS site)

Protecting seafloor habitat is a significant objective of our proposal. Approximately 98% of all known marine species live on or in the seafloor (Thurman and Burton 2001).

To develop a comprehensive approach to designing a network of MPAs on the Central Coast, we systematically identified areas of high overlap to designate 12 important ecological regions that cover the full suite of representative habitat types in the study area. We then evaluated these 12 areas based on adequate coverage of other habitat features, such as shoreline type to ensure that they covered the full range of representative habitats and unique features (Table 1). This proposal is designed to employ adaptive management as information becomes available.

Table 1: Example evaluation of habitat features

Habitat feature	Number of records or area coverage in Central Coast Region	Number of records or area coverage in proposed MPA Network	Percent
Corals and sponges	106 records	86 records	81.1%
Pinnacles	325 pinnacles	296 pinnacles	91.1 %
Nearshore (0-30m) hard substrate	46.6 sq. miles	40.8 sq. miles	87.5%
Shelf (30-100 m) hard substrate	26.8 sq. miles	23.8 sq. miles	88.8%
Deeper Shelf (100-200 m) hard substrate	13.1 sq. miles	13.1	100%
Slope (200+ m) hard substrate	16.16 sq. miles	14.9	92,2%
Major seabird colonies	15	15	100%
Marine mammal rookeries	6	6	100%

Total area of the Ecologically Important Regions was 764 square miles.

Criteria for Identifying Important Ecological Areas:
The Central Coast Regional Profile contains a detailed description of the key ecological features of the study area. The following section summarizes and supplements that document, providing rationale for why these criteria warrant additional protection.

Habitat-forming invertebrates
Corals, sponges, and other habitat-forming invertebrates provide three-dimensional structure on the seafloor that increases the complexity of benthic substrates. While corals and sponges are the most conspicuous and easily observable biogenic structures, they generally occur in diverse biological communities with other invertebrates such as crinoids, basket stars, ascidians, annelids, and bryozoans. Henry (2001) found thirteen hydroid species collected from only four coral specimens, suggesting that northern corals support highly diverse epifaunal communities. Beaulieu (2001) observed 139 taxa associated with deep-sea sponge communities in the

northeast Pacific. Buhl-Mortensen and Mortensen (2004) found 17 species of Pandalus shrimp, isopods, amphipods, copepods, and decapods associated with Paragorgia arborea and Primnoa resedaeformis in Nova Scotia, including an obligate associated copepod. Removal of habitat structure in relatively low-structure soft-sediment systems significantly decreases biodiversity, and consequently that of the wider marine ecosystem (Thrush et al. 2001). Therefore, protecting known areas of coral and sponge habitat inherently protects areas of high benthic diversity and a host of benthic organisms that provide habitat for fish in the form of food and shelter.

Deep sea corals and sponges provide three dimensional structures that form habitat for commercial groundfish, shellfish, and other marine life (Husebo et al. 2002; Krieger and Wing 2002; Malecha et al. 2002; Heifetz 2002). Deep sea corals and sponges are found at depths from 30 meters to over 3,000 meters (Krieger and Wing 2002). Many cup corals, hydrocorals, and *Metridium* anemones are found at depths as shallow as 15 m. Some larger species of deep sea corals, such as *Paragorgia sp*. can grow over 3 m tall. Because these long-lived filter feeders are attached to the seafloor, they may be important indicators of areas in the ocean that have consistently favorable ecological conditions, such as areas of high upwelling that are worth protecting for other reasons as well.

Managed fish species in the west coast region using structure-forming invertebrates (such as corals, basketstars, brittlestars, demosponges, gooseneck barnacles, sea anemones, sea lilies, sea urchins, sea whips, tube worms, and vase sponges) as biogenic habitat include: Arrowtooth flounder, big skate, bocaccio, California skate, cowcod, Dover sole, flag rockfish, greenspotted rockfish, lingcod, longspine thornyhead, Pacific ocean perch, quillback rockfish, rosethorn rockfish, sablefish, sharpchin rockfish, shortspine thornyhead, spotted ratfish, starry rockfish, tiger rockfish, vermilion rockfish, yelloweye rockfish, and yellowtail rockfish (Pacific EFH DEIS).

The document "Preliminary Report on Occurrences of Structure-Forming Megafaunal Invertebrates off the West Coasts of Washington, Oregon and California" (NMFS 2005) found in the Pacific Region EFH DEIS contains the most comprehensive compilation of biogenic habitat records off California, containing data from trawl surveys, ROV and submersible observations, the West Coast Groundfish Observer Program, and ten major research institutions. The data contained in this document was used to identify known locations containing these habitat types within the Central Coast study area.

Hard Substrates

Appendix F of the Master Plan framework states that proposals will be evaluated based on the extent that they "emphasize hard bottom as opposed to soft bottom, because fishing activities within state waters have had the greatest impact on fishes associated with hard bottom, and because soft bottom habitat is interspersed within areas containing rocky habitat" (p.32). Hard substrates, which include rocky ridges and rocky slopes, are one of the least abundant benthic habitats, yet they are among the most important habitats for fishes (Hixon et al. 1991, Pacific EFH DEIS 2005). Hard substrates are also the seafloor substrate type most sensitive to bottom disturbance and take the longest to recover (NAS 2002, Pacific EFH PDEIS 2005).

The EFH DEIS published by the National Marine Fisheries Service states:
Many managed species are dependent on hard bottom habitat during some portion of their life cycle. Typically, deeper water hard bottom habitats are inhabited by large, mobile, nektobenthic fishes such as rockfish, sablefish, Pacific hake, spotted ratfish, and spiny dogfish (MMS 2002). Cross and Allen (1993) estimated that about 30% of the fish species and 40% of the families occur over hard substrates. Many managed groundfish species use hard bottom habitats during one or more life stages including aurora rockfish, bank rockfish, black rockfish, black-and-yellow rockfish, blackgill rockfish, blue rockfish, bocaccio, bronzespotted rockfish, brown rockfish, cabezon, calico rockfish, California scorpionfish, canary rockfish, chilipepper, China rockfish, copper rockfish, cowcod, dusky rockfish, flag rockfish, gopher rockfish, grass rockfish, greenblotched rockfish, greenspotted rockfish, greenstriped rockfish, harlequin rockfish, honeycomb rockfish, kelp greenling, kelp rockfish, leopard shark, lingcod, Mexican rockfish, olive rockfish, Pacific cod, Pacific ocean perch, pink rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, rosy rockfish, rougheye rockfish, sharpchin rockfish, shortbelly rockfish, shortraker rockfish, silvergray rockfish, speckled rockfish, spotted ratfish, squarespot rockfish, starry rockfish, stripetail rockfish, tiger rockfish, treefish, vermilion rockfish, widow rockfish, yelloweye rockfish, yellowmouth rockfish, and yellowtail rockfish (Ch.3, p. 3-7).

Managed species known to use hard bottom habitat in the coastal zone include black rockfish, black-and-yellow rockfish, brown rockfish, cabezon, calico rockfish, California scorpionfish, chilipepper, copper rockfish, gopher rockfish, kelp greenling, leopard shark, lingcod, olive rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, shortbelly rockfish, silvergray rockfish, and spotted ratfish. (Ch 3. p. 3-5)

The Zimmerman (2003) database includes all records from the NMFS West Coast Triennial Trawl Survey where major trawl net hangs and untrawlable survey stations were recorded. These areas are considered unsuitable for trawling due to areas of high structural complexity, such as boulders or rock outcrops (Zimmerman, pers. com.). Substrates or structures that induce a trawl hang provide habitat for juvenile fish (Link and Demarest 2003). The study found that a buffer of 3.7 km (2 nautical miles) around these features would encompass 17-30% of juvenile fish. We used the Zimmerman (2003) database as a supplemental data source indicating hard, complex substrate.

Habitat for overfished groundfish
Several major groundfish species have been designated as overfished and are currently being fished pursuant to rebuilding plans. Most of these species have been documented to use complex structural habitat. Protecting habitats specifically for these species will aid in their recovery, and thus should allow increased harvests to resume after a shorter time period. Habitat suitability modeling performed in the Habitat Comprehensive Risk Assessment (NMFS 2005) identified areas of the highest suitability for overfished groundfish species. These areas occur in the Central Coast study region at several locations.

We are aware that DFG is preparing an analysis of groundfish hotspots in the Central Coast study area and look forward to incorporating this additional information into our proposal as it becomes available.

Submarine canyons and gullies

Submarine canyons are known to be areas of enhanced productivity due to current upwelling zones (Freeland and Denman 1982). For this reason, canyons show enhanced concentrations of benthic invertebrates (Haedrich et al. 1980; Sarda et al. 1994; Vetter and Dayton 1999), plankton (Cartes et al. 1994; Macquart-Moulin and Patriti 1996), demersal fishes (Stefanescu et al. 1994), and whales (Kenney and Winn 1987; Schoenherr 1991) relative to surrounding areas on the slope and shelf. Brodeur (2001) found dense concentrations of Pacific ocean perch (*Sebastes alutus*) and krill associated with biogenic habitats in a Bering Sea submarine canyon, while areas with damaged biogenic structures had far fewer rockfish, and areas in the canyon without biogenic structure had no rockfish. In the North Pacific Ocean, rockfishes in the genus *Sebastes* often inhabit the offshore edges of banks or canyons and are known to capitalize on advected prey resources such as euphausiids (Pereyra et al. 1969; Brodeur and Pearcy 1984; Chess et al. 1988; Genin et al. 1988). Brodeur (2001) found dense aggregations of Pacific ocean perch (*Sebastes alutus*) and euphausiids associated with biogenic habitats in a Bering Sea submarine canyon, while areas with damaged biogenic structures had far fewer rockfish, and areas in the canyon without biogenic structure had no rockfish. Therefore, submarine canyons provide essential habitat for groundfish that is highly vulnerable to fishing impacts.

Vetter and Dayton (2001) found that submarine canyons in Southern California provide large quantities of food in aggregated form on the deep sea floor by acting as conduits for marine macrophyte production produced in the intertidal and shallow subtidal zone. This study also found elevated abundance of Pacific hake and turbot in these canyons. Starr et al. (2002) found evidence for site fidelity in green-spotted rockfish (*S. chlorostictus*) and suggested large-scale reserves for boccacio (*S. paucispinus*) at Soquel Canyon in Monterey Bay.

Submarine canyons provide habitat for larger sized rockfish that seem to prefer structures of high relief such as boulders, vertical walls, and ridges. Yoklavich et al. (2000) found high abundance of large rockfish associated with complex structural habitat in Soquel Canyon with lower size and abundance in fished areas. Canyon heads are the upper, shallower portions of submarine canyons where coastal upwelling fronts have been shown to contain high abundance of rockfish larvae (Bjorkstedt 2002). Additionally, Hooker et. al (1999) found higher abundance of cetaceans in a submarine canyon known as "The Gully" off Nova Scotia relative to surrounding areas of the shelf and slope. The cover and protection offered by submarine canyons allow pockets of rockfish populations to flourish, in contrast to more exposed areas where the populations are more easily fished. Because submarine canyons on the U.S. West Coast are typically upwelling zones, they often contain higher abundances of filter feeding invertebrates, such as corals, sponges, tunicates, and bryozoans, which contribute to the structural complexity of the seafloor.

Kelp Forests

California's kelp forests are not only globally significant, but are also some of the most productive areas in the ocean, providing the primary structure for diverse assemblages of marine species. All species in the Nearshore FMP are associated with kelp during at least one life stage. By focusing protections on kelp forests, along representative areas along the California coast, a high diversity of marine life will be protected. The Central Coast study region is home to both giant kelp as well as bull kelp. Giant kelp forests are present primarily south of Davenport, while bull kelp is found predominately to the north. The presence of kelp in the Central coast

provides habitat and nursery areas for many species of fishes as well as invertebrates (Foster et al. 1985). Kelp is a variable habitat, and distribution and abundance of kelp beds can be affected by climatic and oceanographic changes, as well as certain types of fisheries (Tegner et al 1997; Tegner and Dayton 2000). With regard to giant kelp, researchers in central California found that harvesting of kelp forests affected the distribution of fishes associated with kelp forests, especially juvenile rockfishes (Miller and Giebel 1973, Houk and McCleneghan 1993).

Estuaries and Coastal Marsh

Estuaries and coastal marshes support high levels of productivity and provide habitat for many species. Estuaries play a key role in the coastal ecosystem as nursery habitat for coastal invertebrates and fish. The Central Coast study region includes two relatively large, permanent estuaries, Elkhorn Slough and Morro Bay; as well as several smaller estuaries or coastal marsh lands at the mouths of coastal rivers. Estuarine areas host many species during migration, including salmonids and lampreys. Steelhead in the central coast also spend a significant part of their juvenile phase in coastal estuaries. Since estuaries and surrounding habitat areas are important habitat linkages between marine, aquatic and terrestrial habitats, their condition is closely tied to the condition of the surrounding watershed. Estuaries provide critical ecosystem services such as filtering sediments and nutrients from the watershed, stabilizing shorelines, and providing flood and storm protection. (Central Coast Regional Profile)

Seabirds and Marine Mammals

Marine mammals and seabirds occur throughout the Central Coast study region. The many species of marine mammals and seabirds play an important role in the central coast ecosystem. As predators, marine mammals are integral parts of the marine food chain, impacting species distribution of many smaller species of plants and animals. Seabird similarly feed on the many species of small fishes and invertebrates along the coast. The central California coast is an important nesting area for many seabird and marine mammal colonies.

Some fish, marine mammals and seabirds in the central coast region, whose populations have declined, receive special protections under the Endangered Species Act. In addition, marine mammals are protected under the Marine Mammal Protection Act and migratory seabirds and shorebirds in the study region are protected under the Migratory Bird Treaty Act. Protection of rookery sites, juvenile habitat, and important foraging areas within MPAs can help provide additional protections, increase public awareness, and support monitoring and enforcement efforts. Species that are present in the central coast study region that are provided protection include sea otters, which play an important role in maintaining kelp forests along the central coast by preying on sea urchins and other herbivores that, if not controlled, would overgraze the kelp resulting in denuded areas. Pinnipeds such as the California sea lion, Steller sea lion, northern elephant seal, and the harbor seal as well as Gray whales, porpoises, and bottlenose dolphins and a diverse assemblage of seabirds are also protected species. (Central Coast Regional Profile)

Top 20% Fish and Bird Diversity and Density

Density and diversity of marine life populations are key criteria directly pursuant to the goals of the MLPA. We used the DFG dataset developed for the MLPA process on the IMS site showing

areas that contain the highest 20% diversity and density of fish and birds, which is a compilation of trawl surveys and bird survey data.

Description of Proposal

This preliminary proposal includes 12 Important Ecological areas throughout the Central Coast of California (Appendix 1, Figure 1). Each of these 12 areas is described in detail later in Appendix 2. Each area is divided into several "sub-areas" which are identified on maps and included in a matrix (Appendix 2). The boundaries of the sub-areas are designed to reflect specific ecological features, while attempting to minimize the number of vertices (waypoints) to enhance the enforceability of area boundaries.

Each sub-area is classified by its ecological significance as "relatively important" "important," or "very important." (Appendix 1, Figure 2) These classifications are based on the degree of overlap between multiple key ecological criteria and the significance of the features relative to other areas of the Central Coast. While all three classifications warrant additional management measures and protections, our intention is that the level of additional protection and management objectives will reflect these classifications.

1. "Relatively Important" sub-areas contain some significant ecological criteria and were selected because they play an integral role in the functioning of the larger Important Ecological Areas of which they are a part.
2. "Important" sub-areas contain multiple ecological criteria over extensive features (such as reef systems) and may provide buffers to "very important" sub-areas.
3. "Very important" sub-areas contain the highest diversity of habitat types, overlap of multiple ecological features, and unique habitats. Among the "very important" areas, there should be consideration of representative habitats and food webs for scientific study.

We justify these classifications by providing a summarized list of the key ecological features contained in each sub-area (Appendix 2). Based on these features, a preliminary list of potential anthropogenic threats is assigned to each sub-area using current information (Appendix 2). As more detailed information on anthropogenic impacts becomes available, these lists will be further refined. Finally, we list specific management objectives for each sub-area to meet the goals of the MLPA (Appendix 2). These objectives provide a level of specificity sufficient for detailed analysis of this proposal. We intend to discuss appropriate management measures to meet these objectives for each sub-area as the MLPA process moves forward.

For each sub-area, the matrix lists which of the following management objectives would be applied:

<u>Objective 1: Protect benthic invertebrates and groundfish (Appendix 1, Figure 3).</u>

This objective is meant to maintain and restore populations of species whose populations are likely to benefit from a network of MPAs. The areas with this objective were selected because they contain habitat for abalone, nearshore FMP species, and overfished groundfish species. The layout of these sub-areas is designed to meet the size and spacing recommendations of the Master Plan Framework based on adult neighborhood sizes and larval dispersal distances.

Achieving this objective contributes to objectives 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 3.1, 3.2, 3.4, 4.1, 4.2, 5.2, and 5.3 of the CCRSG Goals and Objectives Package. Figure 3 shows the network of sub-areas with this objective.

Objective 2: Protect seafloor and biogenic habitat (Appendix 1, Figure 4)
This objective serves to protect the components of the marine ecosystem that harbor the highest diversity of marine life. Seafloor and biogenic structures provide the only structures and niches that create complex habitats for a multitude of species. Damage to biogenic structures is likely to be the most detrimental human impact to the resilience of marine populations. Biogenic structures include benthic invertebrates (i.e. corals, sponges, tunicates, bryozoans) and marine algae (ie. giant kelp, bull kelp, seagrass). Protecting the biodiversity, functional diversity, and abundances of marine life requires large areas of intact seafloor and biogenic habitat. This objective includes improving habitat for anadromous fish. Achieving this objective will serve to contribute to objectives 1.1, 1.2, 1.5, 2.1, 2.3, 3.1, 3.2, 4.1, 4.2, 5.2, 5.3 of the CCRSG Goals and Objectives Package. Figure 4 shows sub-areas with this objective

Objective 3: Protect forage base for top predators (Appendix 1, Figure 5)
Top predators are keystone species in marine ecosystems that play a critical role in structuring food webs. Marine mammals, birds, and large fish and sharks are the top predators in the Central Coast study region. Examples of the forage base include squid, schooling fish, and krill. Even if overall populations of forage species are abundant, localized depletion of forage species in the vicinity of bird colonies, marine mammal haulouts and rookeries, and key foraging sites (i.e. upwelling centers) may adversely affect populations and behavior of top predators. Therefore, sub-areas with this objective were selected to prevent localized depletion in the vicinity of such sites. Achieving this objective will contribute to objectives: 1.4, 1.5, 2.1, 2.3, 3.2, 4.1, 5.2, and 5.3 of the CCRSG Goals and Objectives Package. Figure 5 shows sub-areas with this objective

Objective 4: Protect seabird/mammal colonies from anthropogenic disturbance (Appendix 1, Figure 6)
Nesting seabirds and marine mammal rookeries are particularly vulnerable to disturbance by fishing vessels, human incursion, and habitat alteration. This objective serves to protect major nesting sites and rookeries from this type of disturbance to ensure that these federally protected top predators maintain and improve their reproductive success. Achieving this objective will contribute to objectives: 1.1, 1.4, 1.5, 2.1, 3.1, 3.2, 3.4, 4.2, 5.2, and 5.3 of the CCRSG Goals and Objectives Package. Figure 6 shows sub-areas with this objective.

Objective 5: Improve water quality (Appendix 1, Figure 7)
While outside the direct jurisdiction of DFG, water quality is an essential component of marine ecosystems--affecting fish, invertebrates, biogenic habitats, birds, and mammals. There are several "impaired" rivers and water bodies designated by the State Water Resources Control Board as a result of sedimentation, pathogens, and various contaminants. Some of these have Total Maximum Daily Loads (TMDLs) with accompanying programs to improve the water quality of rivers flowing into the Central Coast study region. Sub-areas that receive inputs from these "impaired" water bodies have this objective. To meet this objective, DFG must work with other state and local agencies to improve the water quality of waters flowing into the MPAs designated through the MLPA process. Achieving this objective will contribute to objectives 1.5

and 5.3 of the CCRSG Goals and Objectives Package, as well as a transition to ecosystem-based management on the Central Coast. Figure 7 shows sub-areas with this objective (i.e. adjacent to impaired water bodies.)

Species that will Benefit

Box crab, brown rock crab, dungeness crab, red rock crab, sand crab, spot prawn, bay shrimp, ghost shrimp, mud shrimp, ocean shrimp, sea cucumber, purple urchin, red urchin, black abalone, flat abalone, pinto abalone, red abalone, threaded abalone, market squid, littleneck clam, gaper clam, geoduck clam, manila clam, pismo clam, razor clam, softshell clam, Washington clam, cockles, limpets, mussels, octopus, rock scallop, sea hare, sea stars, moon snail, turban snail, polychaetes, Gelidium sp., Gracilaria sp., Porphyra sp., sea palm, bull kelp, giant kelp, black rockfish, bocaccio, blue rockfish, canary rockfish, cowcod, copper rockfish, darkblotched rockfish, lingcod, olive rockfish, widow rockfish, yelloweye rockfish, aurora rockfish, bank rockfish, black surfperch, chilipepper rockfish, blackgill rockfish, monkeyface prickleback, black-and-yellow rockfish, flag rockfish, brown rockfish, greenblotched rockfish, cabezon, greenspotted rockfish, greenstriped rockfish, calico rockfish, longspine thornyhead, gopher rockfish, halfbanded rockfish, pink rockfish, grass rockfish, flag rockfish, petrale sole, pinkrose rockfish, kelp greenling, gopher rockfish, pink rockfish, redbanded rockfish, kelp rockfish, pinkrose rockfish, rosethorn rockfish, leopard shark, redbanded rockfish, shortspine thornyhead, splitnose rockfish. rosethorn rockfish, stripetail rockfish, pile surfperch, kelp greenling, rosy rockfish, yellowtail rockfish, rainbow surfperch, leopard shark, rubberlip surfperch, ocean whitefish, speckled rockfish, spot prawn, striped surfperch, petrale sole, squarespot rockfish, treefish, pink rockfish, starry rockfish, vermilion rockfish, stripetail rockfish, wolf eel, rosy rockfish, yellowtail rockfish, speckled rockfish, brown rock crab, squarespot rockfish, red rock crab, red rock crab, starry rockfish, vermilion rockfish, sea hares, yellowtail rockfish, brown rock crab, California grunion, butterfish, bat ray, starry flounder, night smelt, white croaker, Pacific hagfish, surf smelt, California skate, barred surfperch, longnose skate, California halibut, Dover sole, Pismo clam, jacksmelt, California halibut, petrale sole, bat ray, brown smoothhound, rex sole, rock sole, brown smoothhound, leopard shark, rock sole, slender sole, leopard shark, night smelt, longspine thornyhead, surf smelt, c-o turbot, shortspine thornyhead, worms, surf smelt, whitebait smelt, sand dab, big skate, sand sole, English sole, shiner surfperch, rex sole, walleye surfperch, white surfperch sand sole, topsmelt, slender sole, c-o turbot, Pacifc tomcod, curlfin turbot, ocean whitefish, curlfin turbot, eel grass

Summary Evaluation and Discussion

The Important Ecological Areas are spaced according to the scientific guidelines of the Master Plan Framework, which state that MPAs should be placed within 31-62 miles of each other to protect bottom-dwelling fish and invertebrates. In fact, the largest distance between each of the 12 Important Ecological Areas of this proposal is 14 miles. The protections to adult fish populations are designed have an alongshore span of at least 3 miles, while protections to marine birds, mammals, and migratory fish are larger, as recommended by the Master Plan Framework.

This proposal was explicitly designed to include areas of high diversity and density. As described above, we used direct indicators (i.e. highest 20% diversity and density of fish and

birds) and indirect indicators (i.e. hard substrate, habitat-forming invertebrates) to locate these areas. Furthermore, we prioritized areas based on ecological importance and corresponding management objectives based on the diversity of these sites. In addition, the proposal includes sites such as Portuguese Ledge, that have previously fostered high population densities, but have declined in recent years.

The proposal includes multiple unique habitats. For example, the proposal includes all five major submarine canyons, both major estuaries, the Monterey shale beds, all three elephant seal rookeries, deep canyon coral and sponge habitat, all major rocky reefs in the southern portion of the study area, rare mudflats and eelgrass beds in Elkhorn Slough, and the rare granitic outcrops between the Monterey Peninsula and Point Sur. The areas include all major upwelling centers, including the areas off Ano Nuevo, Santa Cruz, Outer Monterey Bay, Point Sur, Lopez Point, Piedras Blancas, and Point Conception (Map 4 of CC Regional Profile). In addition, the leeward portions of major headlands are included, specifically with the objective of protecting groundfish and benthic invertebrates. These species groups are those with life histories such that larvae are likely to be retained in such areas. Example areas include Ano Nuevo, Soquel Point, Carmel Bay, Point Sur, Lopez Point, Piedras Blancas, Point Buchon, Point Sal, Purisima Point, Point Arguello, and Point Conception. In addition, all 12 existing MPAs and special closures are included and expanded in this proposal.

The proposal includes multiple opportunities for scientific evaluation of different sizes, types, layouts, and designs of MPAs. Each of the 12 Important Ecological Areas is subdivided into smaller areas that would have different levels of protection. This provides opportunities for side by side comparison of different management regimes in similar areas. These subdivisions vary in size as well, including small areas off Natural Bridges and Lopez Point, to extensive areas at Big Creek and Soquel Canyon. These will provide opportunities to compare the effectiveness of equivalent management measures implemented at different spatial scales, and likely provide useful guidance regarding the optimal size and spacing of MPAs to meet specific objectives. Finally, this proposal contains three categories of layouts of MPAs, including:

1. Adjacent strips extending to 3 miles offshore, each containing different management objectives (i.e. Ano Nuevo, Morro Bay)
2. Core areas of higher protection surrounded by buffer areas that are less restrictive (i.e. Piedras Blancas, Julia Pfeiffer Burns)
3. Simple mosaic of subdivisions to align with major oceanographic features (i.e. Monterey Bay)

Implementation of these three layouts will allow comparison of overall regional strategies to meet multiple conservation objectives while maintaining opportunities for sustainable use in important ecological regions. Since these sites will have different levels of fishing regulations, it will enable the use of MPAs as reference sites for fisheries management.

In conclusion, this preliminary proposal represents a systematic approach to identifying an improved network of Marine Protected Areas based on scientific principles and the best available information. We look forward to further contributing to the MLPA Initiative process by continuing to incorporate additional information into this proposal and participating in discussions with local stakeholders.

References

1. Beaulieu, S. (2001). Life on glass houses: sponge stalk communities in the deep sea. MARINE BIOLOGY 138(4): 803-817.

2. Bjorkstedt, E., L. Rosenfeld, B. Grantham, Y. S and J. Roughgarden (2002). Distributions of larval rockfishes Sebastes spp. across nearshore fronts in a coastal upwelling region. Marine Ecology Progress Series 242: 215-228.

3. Brodeur, R. D. and W. G. Pearcy (1984). Food habits and dietary overlap of some shelf rockfishes (Genus Sebastes) from the northeastern Pacific Ocean. Fishery Bulletin 82: 269-293.

4. Brodeur, R. (2001). Habitat-specific distribution of Pacific ocean perch (Sebastes alutus) in Pribilof Canyon, Bering Sea. Continental Shelf Research 21(3): 207-224.

5. Buhl-Mortensen, L. and P. B. Mortensen (2003). Distribution and diversity of species associated with deep-sea gorgonian corals off Atlantic Canada. Second International Symposium on Deep Sea Corals, Erlangen, Germany.

6. Cartes, J. E., J. B. Company and F. Maynou (1994). Deepwater decapod crustacean communities in the Northwestern Mediterranean: influence of submarine canyons and season. Marine Biology 120: 221-229.

7. Chess, J. R., S. E. Smith and P. C. Fischer (1988). Trophic relationships of the shortbelly rockfish, Sebastes jordani, off Central California. California Cooperative Oceanic Fisheries Investigations Reports 29: 129-136.

8. Engel, J. and R. Kvitek (1998). Effects of otter trawling on a benthic community in Monterey Bay National Marine Sanctuary. Conservation Biology v.12(no.6): 1204-1214.

9. Foster, M.S. and D.R. Schiel. 1985. The ecology of giant kelp forests in California: a community profile. U.S. Fish and Wildlife Service Biological Report 85 (7.2). 152p.

10. Freeland, H. and K. Denman (1982). A topographically controlled upwelling center off Southern Vancouver Island. Journal of Marine Research 40: 1069-1093.

11. Genin, A., L. Haury and P. Greenblatt (1988). Interactions of migrating zooplankton with shallow topography: predation by rockfishes and intensification of patchiness. Deep-Sea Research 35: 151-175.

12. Haedrich, R. L., G. T. Rowe and P. T. Polloni (1980). The megabenthic fauna in the deep sea south of New England, USA. Marine Biology 57(165-179).

13. Henry, L. (2001). Hydroids associated with deep-sea corals in the boreal north-west Atlantic. Journal of the Marine Biological Association of the United Kingdom. 81(1): 163-164.

14. Heifetz, J. (2002). Coral in Alaska: Distribution, abundance, and species associations. Hydrobiologia 471: 19-28.

15. Hixon, M. A., B. N. Tissot and W. G. Pearcy (1991). Fish assemblages of rocky banks of the Pacific Northwest. OCS Study MMS 91-0052, USDI Mineral Management Service.

16. Hooker, SK; Whitehead, H; Gowans, S. 1999. Marine protected area design and the spatial and temporal distribution of cetaceans in a submarine canyon. Conservation Biology; June, 1999; v.13, no.3, p.592-602.

17. Houk, J.L., and K. McCleneghan. 1993. Effects of kelp canopy removal on young-of-the-year rockfish abundance, using two census methods. Calif. Dept. Fish & Game, Marine Resources Admin. Rept. 93-5. 29 p.

18. Husebo, A., L. Nottestad, J. Fossa, D. Furevik and S. Jorgensen (2002). Distribution and abundance of fish in deep-sea coral habitats. HYDROBIOLOGIA 471,SI: 91-99.

19. Kenney, R. D. and H. E. Winn (1987). Cetacean biomass densities near submarine canyons compared to adjacent shelf/slope areas. Continental Shelf Research 7(107-114).

20. Krieger, K. J. and B. L. Wing (2002). Megafauna associations with deepwater corals (Primnoa spp.) in the Gulf of Alaska. Hydrobiologia v.471: p.83-90.

21. Link, J. S. and C. Demarest (2003). Trawl hangs, baby fish, and closed areas: a win-win scenario. ICES Journal of Marine Science 60: 930-938.

22. Macquart-Moulin, C. and G. Patriti (1996). Accumulation of migratory micronekton crustaceans over the upper slope and submarine canyons of the northwestern Mediterranean. Deep-Sea Research 43: 579-601.

23. Malecha, P. W., R. J. Stone and J. Heifetz (2002). Living substrate in Alaska: Distribution, abundance, and species associations. Manuscript submitted at the Symposium on Effects of Fishing Activities on Benthic Habitats, Tampa, Florida, November 12-14, 2002.

24. Miller, D.J., and J.J. Geibel. 1973. Summary of blue rockfish and lingcod life histories; a reef ecology study; and giant kelp, Macrocystis pyrifera, experiments in Monterey Bay, California. Fish Bulletin 158. Calif. Dep. Fish and Game, Sacramento, California. 137 p.

25. National Marine Fisheries Service (NMFS). 2005. Pacific Coast Groundfish Fishery Management Plan Essential Fish Habitat Designation and Minimization of Adverse Impacts Draft Environmental Impact Statement. Northwest Region. February 2005.

26. National Research Council (NRC). 2002. Effects of Trawling and Dredging on Seafloor Habitat. Washington, D.C, National Academy of Sciences.

27. Pereyra, W. T., W. G. Pearcy and C. J. F.E. (1969). Sebastodes flavidus, a shelf rockfish feeding on mesopelagic fauna, with consideration of the ecological implications. Journal of the Fisheries Research Board of Canada 26: 2211-2215.

28. Sarda, F., J. E. Cartes and J. B. Company (1994). Spatio-temporal variations in megabenthos abundance in three different habitats of the Catalan deep-sea (Western Mediterranean). Marine Biology 120(211-219).

29. Schoenherr, J. R. (1991). Blue whales feeding on high concentrations of euphausiids around Monterey Submarine Canyon. Canadian Journal of Zoology 69(583-594).

30. Starr, R. M., J. N. Heine, J. M. Felton and G. M. Cailliet (2002). Movement of boccacio (Sebastes paucispinis) and greenspotted (S. chlorostictus) rockfishes in a Monterey submarine canyon: implications for the design of marine reserves. Fisheries Bulletin 100: 324-337.

31. Stefanescu, C., B. Morales-Nin and E. Massuti (1994). Fish assemblages on the slope in the Catalan Sea (Western Mediterranean): Influence of a submarine canyon. Journal of the Marine Biological Association of the UK 74(499-512).

32. Tegner, M.J., P.K Dayton, P.B. Edwards, and K.L. Riser. 1997. Large-scale, low frequency oceanographic effects on kelp forest succession: a tale of two cohorts. Marine Ecology Progress Series Vol 146:117-134.

33. Tegner, M.J. and P.K.Dayton. 2000. Ecosystem effects of fishing in kelp forest communities. ICES Journal of Marine Science. Vol 57:579-589.

34. Thurman, Harold V. and Elizebeth Burton. 2001. Introductory Oceanography, Ninth Edition. Prentice Hall.

35. Thrush, S. F., J. E. Hewitt, G. A. Funnell, V. J. Cummings, J. Ellis, D. Schultz, D. Talley and A. Norkko (2001). Fishing disturbance and marine biodiversity: the role of habitat structure in simple soft-sediment systems. Marine Ecology Progress Series 223: 277-286.
Vetter, E. W. and P. K. Dayton (1998). Macrofaunal communities within and adjacent to a detritus-rich submarine canyon system. Deep-Sea Research II 45(25-54).

36. Vetter, E. W. and P. K. Dayton (1998). Macrofaunal communities within and adjacent to a detritus-rich submarine canyon system. Deep-Sea Research II 45(25-54).

37. Vetter, E. and P. Dayton (1999). Organic enrichment by macrophyte detritus, and abundance patterns of megafaunal populations in submarine canyons. Marine Ecology Progress Series 186: 137-148.

38. Yoklavich, M. M., H. G. Greene, G. M. Cailliet, D. E. Sullivan, R. N. Lea and M. S. Love (2000). Habitat associations of deep-water rockfishes in a submarine canyon: An example of a natural refuge. Fishery Bulletin (Washington D C) v.98(no.3): p.625-641.

39. Zimmerman, M. (2003). Calculation of untrawlable areas within the boundaries of a bottom trawl survey. Canadian Journal of Fisheries and Aquatic Sciences. 60: 657-669.